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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/098,730	06/18/1998	TOMIO SUGIYAMA	PM-254782	4440

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NIXON & VANDERHYE, PC
1100 N GLEBE ROAD
8TH FLOOR
ARLINGTON, VA 22201-4714

EXAMINER	
OLSEN, KAJ K	

ART UNIT	PAPER NUMBER
1753	

DATE MAILED: 02/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/098,730	SUGIYAMA ET AL.	
	Examiner	Art Unit	
	Kaj K Olsen	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,6,7,10,11,18-22 and 24-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,6,7,10,11,18-22 and 24-44* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claims 1, 2, 4, 6, 7, 10, 11, 18-22 and 24-38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. Claims 1 and 18 have been amended to specify that the boundary layer is positioned between a gas chamber and the outside of the sensor. It is unclear if the applicant is actually claiming the presence of a gas chamber because the chamber is only referred to in context of the boundary layer and has never been identified as being explicitly present. New claim 39 does not possess this confusion because it is clear that a gas chamber is present. For the purpose of examination, the examiner will assume the claimed presence of a gas chamber in claims 1 and 18, but clarification is requested.

3. In new claim 33, it is unclear if the "a gas chamber" at the end of the claim is the same thing as the "sample gas chamber" earlier. If it is, then applicant should refer to it as --said sample gas chamber-- (see claim 39 as an example). If it is not, then the "a gas chamber" of claim 33 would also be indefinite for the reasons giving for claims 1 and 18. For the purpose of examination, the examiner will construe the "a gas chamber" as reading on either the same or different chamber, but clarification is requested.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1, 2, 4, 6, 7, 10, 11, 18-22, 26, 29-33, 36-39, 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mase et al 4,861,456 in view of Suzuki et al 4,177,112.

6. With respect to claims 1, 2, 4, 6, 7, 10, 11, 18-22, 26 and 29-32, these claims were previously rejected over the combined teachings of Mase and Suzuki because alumina layer 54 of Mase read on the applicant's claimed "boundary layer" that is interposed between a solid electrolyte substrate layer 28 and insulating substrate layer 50, and Suzuki rendered obvious the use of larger average sintered particle sizes for forming the boundary layer. See any of the previous Office Actions. Claims 1 and 18 have been amended to specify that the boundary layer "serves as a partition positioned between a gas chamber and the outside of the sensor". It would appear to the examiner that this new limitation is met by the teaching of Mase because layer 54 both serves as a partition and is between gas chamber 6 and the outside of the sensor (i.e. the space below element 42). See fig. 3 as an example. The "boundary layer" 54 of Mase might not be as close to the outside of the sensor as fig. 10-12 of the instant invention show (which is what amended claims 1 and 18 would appear to read on), but that distinction has not been claimed. The boundary need merely be "between" the gas chamber and the outside of the sensor to meet the amended claim.

7. With respect to new independent claims 33 and 39 (those limitations not covered previously), these claims differ from the rejected claims 1 and 18 by specifying that the boundary layer be between two solid electrolyte substrate layers. Said "boundary layer" would be met by elements 20 or 34 of Mase which is positioned respectively between solid electrolyte layers 8 and 10 and 8 and 28. See fig. 1 and 3 and col. 6, lines 50-68. Electrolyte layers 10 and 28 would constitute ceilings and bottoms for gas chamber 6.

8. With respect to new claims 36 and 42, these claims are referring to green sheets of alumina and zirconia. Using green sheets of materials constitutes a process for constructing the sensors. The determination of patentability for the claim is based on the product itself. Because the product of the claim is identical to the teaching of Mase in view of Suzuki, the process from which it was made is the same as or obvious over the process utilized by Mase in view of Suzuki (see *In re Thorpe*, 777 F.2d 695, 698).

9. With respect to claims 37 and 43, both Mase and Suzuki suggest utilizing zirconia, including partially stabilized zirconia. See Mase, col. 7, lines 33-43 and Suzuki, col. 5, lines 26-31. With respect to the limitation drawn to the thermal expansion coefficient, absent a particular definition of what the applicant construes as being "substantially the same", the fact that zirconia and alumina are explicitly recited choices for these two sensor components (see discussion above and Mase, col. 6, line 53), this limitation is met by the teachings of Mase and Suzuki.

10. With respect to claims 38 and 44, see Mase, col. 6, lines 59-65.

11. Claims 24, 27, 34 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mase et al in view of Suzuki et al and Sugino et al 5,593,558 and Tatumoto et al 5,522,979.

12. These claims further differ by calling for the alumina boundary layer 54 and 34 to be made primarily of alpha-alumina with an average sintering particle diameter of 3-4 microns. Sugino discloses an alumina layer in a solid electrolyte sensor comprising alpha-alumina. See col. 13, line 61. Tatumoto discloses alumina particles with a size of 2.3 microns, which is very close to applicant's 3 microns value. See col. 8, lines 35-40. It would have been obvious for Mase to use alpha-alumina with a particle size of 3 microns for its alumina layers 54 and 34 in

view of Sugino and Tatumoto, since the incorporation of known features from analogous prior art functioning as expected is within the skill of the art.

13. Claims 25, 28, 35 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mase et al in view of Suzuki et al and Watanabe et al 4,370,393 or Ikezawa et al 4,421,787.

14. These claims further differ by calling for the electrolyte layer to be made of zirconia partially stabilized by yttria with an average sintering particle diameter of 2-3 microns. Watanabe discloses yttria-stabilized zirconia to be a conventional solid electrolyte material. See col. 4, lines 25-29. Sample 22 in Table 1(c) shows a grain size of 3 microns. Ikezawa also discloses a conventional solid electrolyte of yttria-stabilized zirconia with a particle size of 0.5 to 8 microns. See col. 5, lines 21-41. It would have been obvious for Mase to adopt a yttria-stabilized zirconia electrolyte with a particle size of 3-4 microns in view of Watanabe or Ikezawa since the incorporation of known features from analogous prior art functioning ms expected is within the skill of the art.

15. Claims 37 and 43 are rejected in the alternative under 35 U.S.C. 103(a) as being unpatentable over Mase in view of Suzuki as applied to claims 33 and 39 above, and further in view of Mase et al (USP 4,559,126) (hereafter "Mase '126"). The primary Mase teaching will continue to be just "Mase".

16. If the combined teaching of Mase and Suzuki are construed as not meeting the limitation concerning the thermal expansion coefficient being "substantially the same", then Mase '126 teaches making the coefficients of expansion for the various sensor layers to be "substantially the same" to prevent the sensor from warping during sintering. See col. 2, lines 54-58; col. 4, lines 62-67; and col. 6, lines 7-15. It would have been obvious to one of ordinary skill in the art at the

time the invention was being made to utilize the teaching of Mase '126 for the sensor of Mase and Suzuki to prevent warping of the sensor during sintering.

Response to Arguments

17. Applicant's arguments filed 11-23-2004 have been fully considered but they are not persuasive. With respect to the new limitations and new claims, those issues are addressed in the rejection above and will not be reiterated here. However, the examiner will touch on issues raised concerning the basis for the rejection (namely the combination of Mase of Suzuki). Applicant urges that the layers of 20, 34 and 54, which Mase describes as "porous", must be "gas-tight" in order to preserve the integrity of the sensor. This is a confusing argument. First, the examiner finds it hard to believe that layers labeled by Mase as being "porous" are actually "gas-tight" when Mase clearly understands the distinction between layers that are desired to be "porous" and layers that are desired to be "gas-tight" (compare col. 6, lines 61-65 with col. 9, lines 8-12). To suggest that porous materials have to be gas tight would appear to go against the distinction Mase established. Second, it is unclear why applicant came to the conclusion that the porous layers of Mase must be gas-tight in order to maintain the integrity of the sensor when Mase makes no statements to that effect and contradicts the assertion that the porous layer must be gas-tight (see above). For the sake of argument, if the examiner accepts that gas cannot be allowed to diffuse through the layers 20, 34 and 54 in order to maintain the integrity of the sensor, one possessing ordinary need not invoke the applicant's illustrated scenario to prevent this from happening. For example, one possessing ordinary skill in the art could seal the outside edges of the sensor to prevent gas from diffusing in. One could also utilize a combination of the

layer porosity, layer thickness and/or the diffusion path length through the layer such that the amount of gas allowed to diffuse to or from the gas chamber marginal. One could also operate the sensor such that the gas pressure in chamber 6 roughly equal to the outside gas environment, thereby minimizing diffusion in either direction. Hence, it is unnecessary for one possessing ordinary skill in the art to necessarily assume that the "porous" layers have to be made gas-tight for appropriate sensor operation.

18. Once applicant urges that the "porous" layer of Mase must be "gas-tight", applicant then urges that it would not have been obvious to utilize the teaching of Suzuki to modify the porous layers of Mase because Suzuki is drawn to making porous layers that are not gas-tight by design. It should be pointed out that the validity of this argument rests on the applicant's earlier argument that Mase's "porous" layers must be "gas-tight", which the examiner did not find convincing (see above). Even ignoring that earlier issue, the examiner does not find this argument about Suzuki convincing either. In particular, this argument appear to imply that the rejection in question would result in literally utilizing Suzuki's specific porous layer for the specific layers of Mase. The use of Suzuki here is more general than that. The larger conclusion one possessing ordinary skill in the art would have recognized from Suzuki is that larger particle sized ceramics are more porous than smaller particle sized ceramics (see previous Office Actions). Because it has been established that it would have been obvious to have the porosity of layers 20, 34 and 54 of Mase exceed the porosity of the various solid electrolyte and insulating layers about them (see the Board's decision), then one possessing ordinary skill in the art would recognize that larger particles could have been utilized to establish that larger porosity. Just because Suzuki desired a particular level of porosity doesn't mean the teaching of Suzuki

wouldn't have relevancy for sensors desiring either greater or reduced porosity. If Mase desires a porous, but gas-tight material, then one possessing ordinary skill in the art would have recognized the obviousness of utilizing particles large enough to provide that porosity without sacrificing the gas-tightness of the layers.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kaj Olsen whose telephone number is (571) 272-1344. The examiner can normally be reached on Monday through Thursday from 5:30 A.M. to 3:00 P.M. and on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AU 1753
February 4, 2005

KAJ K. OLSEN
PRIMARY EXAMINER